

TOPEX/POSEIDON Navigational and Orbit Maintenance Support During Solar Maximum Cycle of 1999 to Present

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TOPEX/Poseidon satellite, launched on August 10, 1992, has entered its 9th year of its successful operation this year. The mission, a joint US-French program, is designed to study and gather information about the world's oceans and better understand ocean circulation. Since mid 1999, the spacecraft orbit has been maintained during the solar maximum. About every 11 years the sun undergoes a period of heightened activity. There are frequent solar flares, lots of sunspots and the corona expands to many times its average size.

Orbit Maintenance Maneuver (OMM) designs are dependent upon accurate and effective predictions of atmospheric drag, solar radiation and also reliable predictions of the anomalous along track forces to maintain the TOPEX ground track within its ± 1 km equatorial longitude control boundary. The number of OMMs has increased in comparisons to early years of mission. An average of 4 OMMs are being designed and implemented per year to maintain the ground track requirements. This paper presents the further use of the passive technique of solar panel bias strategy in operational navigation which was first demonstrated in 1993.

The current solar maximum and its effect on orbital decay (higher drag) have necessitated the greater use of this solar panel bias strategy in TOPEX navigation. Because of reduction in manpower and streamlining the orbit support for TOPEX mission, the navigation team proposed to perform the OMM at fixed yaw attitude mode, flying forward periods, if possible. The effect of this technique is presented through ground track plots to help place the maneuver at an operationally convenient time in fixed yaw flying forward, to standardize maneuvers, to reduce and simplify design, constraint checking, to counter the uncertainty in ground track predictions and to eliminate large yaw turns. The role of solar panel pitch bias variations during fixed yaw periods are currently being used to maintain the ground track and maximize spacing between maneuvers as much as possible.